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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/790,188	03/02/2004	Katsunori Suzuki	118655	2943

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OLIFF & BERRIDGE, PLC  
P.O. BOX 19928  
ALEXANDRIA, VA 22320

EXAMINER
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MACARTHUR, SYLVIA

ART UNIT	PAPER NUMBER
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1763

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/29/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/790,188

Applicant(s)

SUZUKI ET AL.

Examiner

Sylvia R. MacArthur

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 10-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/5/2007 has been entered.

### *Response to Arguments*

2. Applicant's arguments with respect to claims 1-9 have been considered but are moot in view of the new ground(s) of rejection. Applicants clarification during the interview held 2/21/2007 and the examiner's interpretation of the invention can be summarized as a quartz ring comprising an inner perimeter that *is located around and/or surrounding the workpiece and/or the showerhead electrode*, such that the height of the first region (nearest the workpiece and/or the showerhead electrode) is greater than that of the second region (extending outward from the first region) as illustrated in Fig.1 specifically elements 18 and/or 20. Note the italicized portion is yet to be claimed in claim 1, but is in the examiner's view the best representation of the invention.

The prior art of Suzuki et al or Ma et al fail to teach the quartz ring as recited above. Regarding the prior art of Dhindsa et al wherein a quartz ring 11 integral to/located around the showerhead electrode 10 still reads upon the present invention. See the marked up copy of Figs. 1B and 1C for an illustration of the examiner's interpretation. The above clarification also necessitated the reintroduction of the prior art of Rossman et al. In the remarks dated 8/30/2006,

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applicant states ...upon a closer examination of Fig. 3 of Rossman, it is clear that there are two shield members 60 and 62, which together form the shield 5. Accordingly, because the two shield members 60 and 62 are distinct, Rossman does not teach that the first region and the second region are regions of the same quartz ring. Thus, Rossman fails to disclose or suggest each and every feature of independent claims 1 and 6. Thus, independent claims 1 and 6, and their dependent claims, are patentable over Rossman. Upon reconsideration, the examiner notes that there are two possible interpretations of Rossman, A) one using both shield members 60 and 62 to connote the quartz ring and the other B) wherein shield member 60 is the quartz ring. Note that the examiner interprets the shield 5 as a quartz ring comprising rings 60 and 62. Claim 1 as broadly interpreted does not require that that ring be monolithic or that it is only one piece. The prior art of Ishii (US 5,529,657) is introduced to show that the claims as written also read upon a ring comprising a plurality of portions, see Fig. 8.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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4. Claims 1-3, 6, and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishii (US 5,529,657).

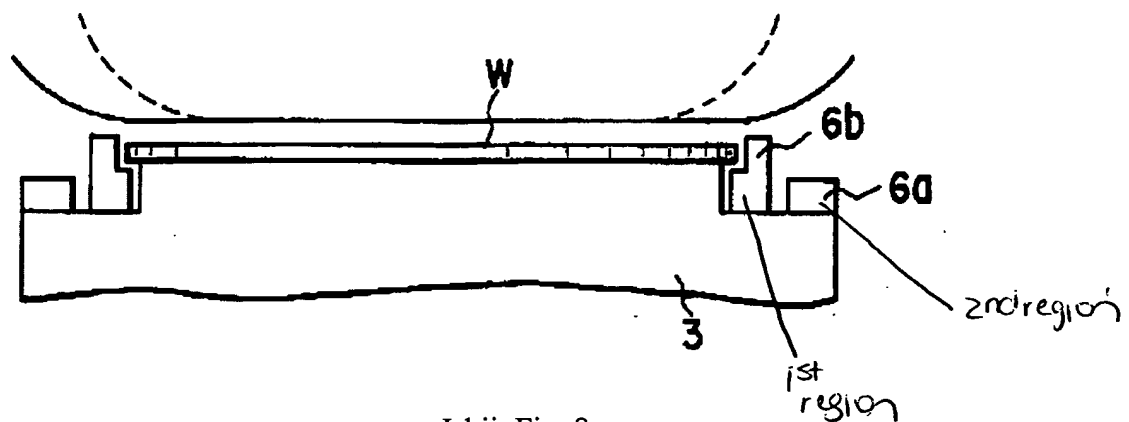
Re claim 1: Ishii teaches a quartz ring 6 (see col. 4 lines 49-51) for use in a plasma processing apparatus, comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other, see Fig. 8.

Re claim 2: The second region is flat and is parallel to the first region, see Fig.8

Re claim 3: Fig.8 of Ishii illustrates a flat second surface 18 that is parallel to the first region.

Re claim 6: Ishii further teaches a processing chamber 2, a electrode (electrostatic chuck sheet) 4 which is part of rest table 3, and a quartz ring 6 comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other, see Figs. 1 and 8.

Re claim 7: See Figs. 1 and 8



Ishii, Fig. 8

5. Claims 1-3, 6,7 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Dhindsa et al (US 6,391,787).

Re claim 1: Dhindsa et al teaches a quartz ring (see col. 6 line 10 and Figs. 1A-C), teaches a quartz ring 11 integral with showerhead electrode 10 for use in a plasma processing apparatus, comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other.

Re claim 2: The second region is flat and is parallel to the first region, see Fig.1A-C

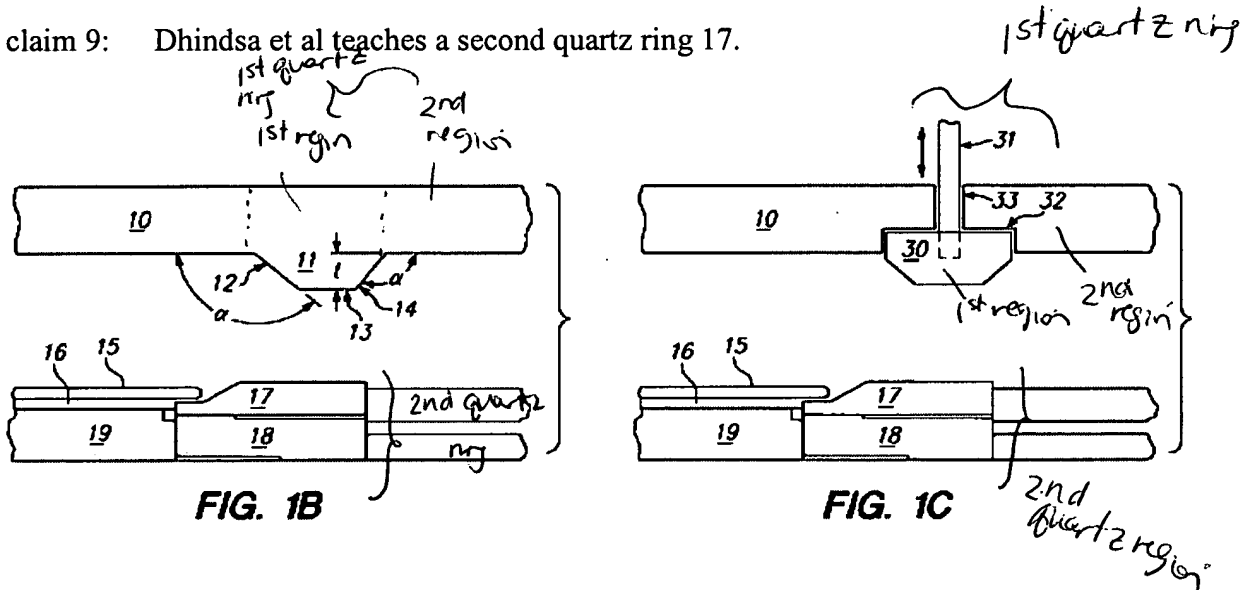
Re claim 3: Fig.1A-C of Dhindsa et al illustrates a flat second surface that is parallel to the first region, see marked up copies of Figs. 1B and 1C below..

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Re claim 6: Dhindsa et al further teaches a processing chamber, a electrode 10, and a quartz ring 11/30 comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other, see Fig. 1B,C.

Re claim 7: See Fig. 1B,C

Re claim 9: Dhindsa et al teaches a second quartz ring 17.



### Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

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such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rossman et al (US 5,748,434) in view of Ishii.

Re claim 1: Rossman et al teaches a ring 5 (see Fig. 4 and col. 4 and 5 ) for use in a plasma processing apparatus, comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other.

Rossman et al teaches that the ring is made of dielectric(see col. 5 lines 15-25), but Rossman et al fails to teach that ring 5 is made specifically of quartz.

The teachings of Ishii were discussed above. Recall the ring of Ishii is made a quartz, a known dielectric material. The motivation to construct the ring of Rossman et al of quartz is that that this dielectric material has such properties as it is a known insulator. Thus, it would have been obvious to construct the ring of Rossman et al of quartz as it is a known dielectric and insulator material. Additionally, the courts have held that the selection of a material based upon its suitability for its intended use is prima facie obviousness, *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 US 327, 65 USPQ 297 (1945).

Re claim 2: The second region is flat and is parallel to the first region, see Fig.4

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Re claim 3: Fig.4 of Rossman et al illustrates a flat second surface 18 that is parallel to the first region.

Regarding claims 4 and 8: Rossman et al teaches in the paragraph adjoining cols.5 and 6 that the edges of the wafer receive a higher deposition rate if the shield 5 extends above the wafer.

The specific height of the stepped regions is a matter of optimization, the courts have held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one of ordinary skill in the art to have determined the optimum values of the relevant process parameters (such as the heights of the portions of the focus ring) through routine experimentation in the absence of a showing of criticality, *In re Alert*, 220 F. 2d 454, 105 USPQ 233, 235 (CCPA 1955). The motivation for provide a difference in height between the first and second regions with the first region being higher than the second is to protect the chamber and electrodes from damage from the plasma process or that the height of the first portion is the same as the wafer to protect the wafer from over processing.

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to optimize the heights of the first and second regions and their subsequent difference in height to ensure optimal protection of the chamber and electrode.

Regarding claim 5: Rossman et al fails to teach the ring 5 is beveled.

In col. 8 lines 10-19 and col.9 lines 5-23, Dhindsa et al teaches beveling the inner edge of edge ring 24. Therein, Dhindsa et al teaches beveling is performed to form an angle with a plane perpendicular to the wafer surface. According to the col. 9 lines 5-23, the beveling affects the processing rate. The motivation to bevel the rings of Dhindsa as taught in col. 9 lines 19-23 is

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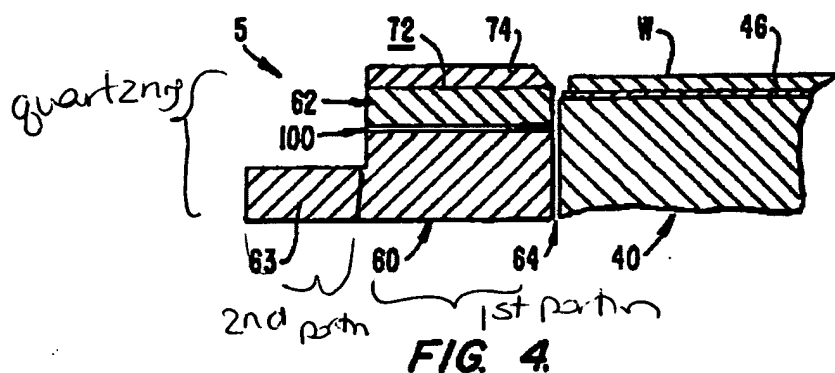
that beveling causes the perturbation of the plasma sheath which increase the edge processing rate. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to bevel the contour along the inner perimeter of the quartz ring of Ishii or Dhindsa et al to provide increased processing rate.

Re claim 6: Rossman et al further teaches a processing chamber 8, a electrode (electrostatic chuck sheet) 4, and a ring 5 comprising: an inner perimeter, a main surface extending outwardly from the inner perimeter; a first portion around the inner perimeter, the first portion having a flat first region on the main surface; and a second portion adjacent to an outer perimeter of the first portion having a smaller thickness than the first portion, the second portion having a second region adjacent to the first region on the main surface, the second region having a height lower than that of the first region; wherein the first region and the second region are regions of the quartz ring and are parallel to each other, see Figs. 1 and 4.

Rossman et al teaches that the ring is made of dielectric(see col. 5 lines 15-25), but Rossman et al fails to teach that ring 5 is made specifically of quartz.

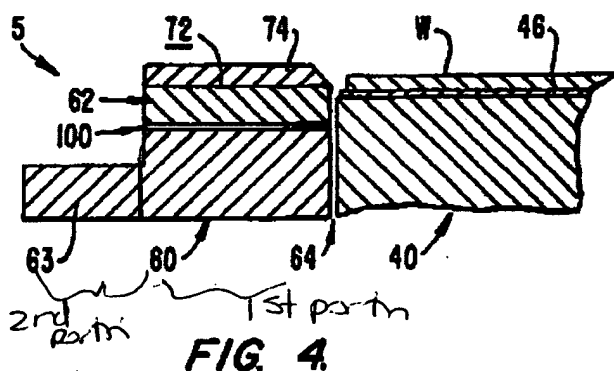
The teachings of Ishii were discussed above. Recall the ring of Ishii is made a quartz, a known dielectric material. The motivation to construct the ring of Rossman et al of quartz is that that this dielectric material has such properties as it is a known insulator. Thus, it would have been obvious to construct the ring of Rossman et al of quartz as it is a known dielectric and insulator material. Additionally, the courts have held that the selection of a material based upon its suitability for its intended use is prima facie obviousness, *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 US 327, 65 USPQ 297 (1945).

Re claim 7: See Figs. 1 and 8



Interpretation.

A.  
quartz ring includes  
60 and 62



B quartz ring  
includes only  
60

Examiner's interpretation of Rossman et al.

8. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii or Dhindsa et al.

The teachings of Ishii or Dhindsa et al were discussed above.

Ishii or Dhindsa et al fail to teach the specific dimensions for the heights of the first and second regions.

Ishii teaches in col. 5 lines 1-12 that the dimensions of the focus ring 6 must be such that that the lines of electric force in the chamber are attracted by the central portion of the chamber so as to be parallel with the workpiece, W.

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Dhindsa teaches in the abstract that the geometric features of the stepped upper and lower ring achieve the desired etch profile across the wafer surface.

The specific height of the stepped regions is a matter of optimization, the courts have held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters (such as the heights of the portions of the focus ring) through routine experimentation in the absence of a showing of criticality, *In re Aller*, 220 F. 2d 454, 105 USPQ 233, 235 (CCPA 1955). The motivation for provide a difference in height between the first and second regions with the first region being higher than the second is to protect the chamber and electrodes from damage from the plasma process or that the height of the first portion is the same as the wafer to protect the wafer from over processing.

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to optimize the heights of the first and second regions and their subsequent difference in height to ensure optimal protection of the chamber and electrode.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art of Dhindsa et al or Ishii in view of Dhindsa et al.

The teachings of the prior art of Ishii or Dhindsa et al were discussed above.

Dhindsa et al fails to teach the ring 11 or 30 is beveled. In col. 8 lines 10-19 and col.9 lines 5-23, Dhindsa et al does teach beveling the inner edge of edge ring 24. Therein, Dhindsa et al teaches beveling to form an angle with a plane perpendicular to the wafer

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surface. According to the col. 9 lines 5-23, the beveling affects the processing rate. The motivation to bevel the rings of Dhindsa as taught in col. 9 lines 19-23 is that he beveling causes the perturbation of the plasma sheath, which increase the edge processing rate. The prior art by Ma et al teaches a ring surrounding a workpiece in a plasma chamber. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to bevel the contour along the inner perimeter of the quartz ring of Ishii or Dhindsa et al to provide increased processing rate.

### *Conclusion*

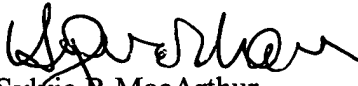
10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Erskine et al (US 5,662,029) see Fig.2 (first portion 31 and second portion 33) and Inoue et al (US 2002/0185658) see Fig.3A element 82 is the first portion while element 80 is the second portion both teach ring comprising a plurality of portions, neither teach that the rings are made of quartz or are broadly constructed of a dielectric material.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Sylvia R. MacArthur  
Patent Examiner  
Art Unit 1763

March 27, 2007